

NARRAGUAGUS RIVER BASIN
CHERRYFIELD, MAINE

CHERRYFIELD DAM
ME-00061

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

The original hardcopy version of the report
contains color photographs and drawings.
For additional information on this report
please email

U.S. Army Corps of Engineers
New England District
Email: Library@nae02.usace.army.mil



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

MARCH 1979

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

407-102

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ME 00061	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Cherryfield Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS		8. CONTRACT OR GRANT NUMBER(s)
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE March 1979
		13. NUMBER OF PAGES 45
		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) DAMS, INSPECTION, DAM SAFETY, Narraguagus River Basin Cherryfield Maine Narraguas River		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The dam is 24.5 ft. high stone filled timber crib and earth embankment structure. The dam is assessed to be in good condition. There are no major areas of concern. It is intermediate in size with a hazard potential of high.		



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF
NEDED

SEP 17 1979

Honorable Joseph E. Brennan
Governor of the State of Maine
State Capitol
Augusta, Maine 04330

Dear Governor Brennan:

I am forwarding to you a copy of the Cherryfield Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Agriculture and the Department of Transportation, cooperating agencies for the State of Maine. In addition, a copy of the report has also been furnished the owner, Town of Cherryfield, Town Office, Cherryfield, Maine 04622.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you, the Department of Agriculture and the Department of Transportation for your cooperation in carrying out this program.

Sincerely yours,


MAX B. SCHEIDER

Colonel, Corps of Engineers
Division Engineer

Incl
As stated

NARRAGUAGUS RIVER BASIN

CHERRYFIELD, MAINE

CHERRYFIELD DAM

ME-00061

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

ME-00061

CHERRYFIELD DAM

CHERRYFIELD

WASHINGTON COUNTY, MAINE

NARRAGUAGUS RIVER

November 29, 1978

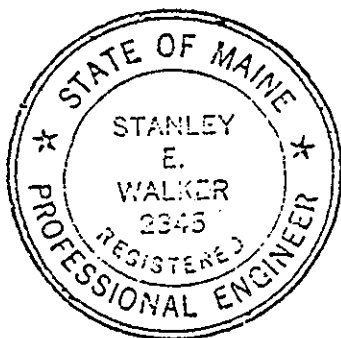
BRIEF ASSESSMENT

The Cherryfield Dam is a 24.5-foot high stone-filled timber crib and earth embankment structure. It consists of stone-filled timber crib abutments, a stone-filled timber crib spillway section, and earthfill embankments. The dam is about 500 feet long including embankment sections.

Based on the visual inspection and reports of past operational performance, the Cherryfield Dam is assessed to be in good condition. There are no areas of major concern.

Based on size classification (intermediate) and hazard potential (high), the spillway test flood is the probable maximum flood (PMF). The spillway capacity is approximately 24,000 cfs or about 44 percent of the routed test flood outflow. During the test flood, water would overtop the earth embankments by about 7 feet. The routed 1/2 PMF outflow would overtop the west embankment by about 1 foot.

The following items of remedial maintenance, as outlined in Section 7, should be implemented to enhance the integrity of the structure within 2 years after receipt of this report by the owner: 1) fill the sag in the west embankment to grade; 2) replace downstream stop logs in west sluiceway; 3) refill the center upstream timber crib pier with stones, and develop a formal warning system and implement its use in the event of an emergency.



EDWARD C. JORDAN CO., INC.

Stanley E. Walker
Stanley E. Walker, P.E.
Project Officer

Cherryfield Dam

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonable possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

This Phase I Inspection Report on Cherryfield Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

Joseph A. McElroy

JOSEPH A. MCELROY, MEMBER
Foundation & Materials Branch
Engineering Division

Carney M. Terzian

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

Joseph W. Finegan, Jr.

JOSEPH W. FINEGAN, JR., CHAIRMAN
Chief, Reservoir Control Center
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

TABLE OF CONTENTS

	<u>PAGE</u>
LETTER OF TRANSMITTAL	
BRIEF ASSESSMENT.....	i
REVIEW BOARD SIGNATURE SHEET.....	ii
PREFACE.....	iii
TABLE OF CONTENTS.....	iv
OVERVIEW PHOTOGRAPH.....	vi
LOCATION MAP.....	vii

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL.....	1-1
1.2 DESCRIPTION OF PROJECT.....	1-1
1.3 PERTINENT DATA.....	1-3

SECTION 2 - ENGINEERING DATA

2.1 DESIGN.....	2-1
2.2 CONSTRUCTION.....	2-1
2.3 OPERATION.....	2-1
2.4 EVALUATION.....	2-1

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS.....	3-1
3.2 EVALUATION.....	3-2

SECTION 4 - OPERATING PROCEDURES

4.1 PROCEDURES.....	4-1
4.2 MAINTENANCE OF DAM.....	4-1
4.3 MAINTENANCE OF OPERATING FACILITIES.....	4-1
4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT.....	4-1
4.5 EVALUATION.....	4-1

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES.....	5-1
---------------------------------	-----

TABLE OF CONTENTS (Continued)

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY.....	6-1
---	-----

SECTION 7 - ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

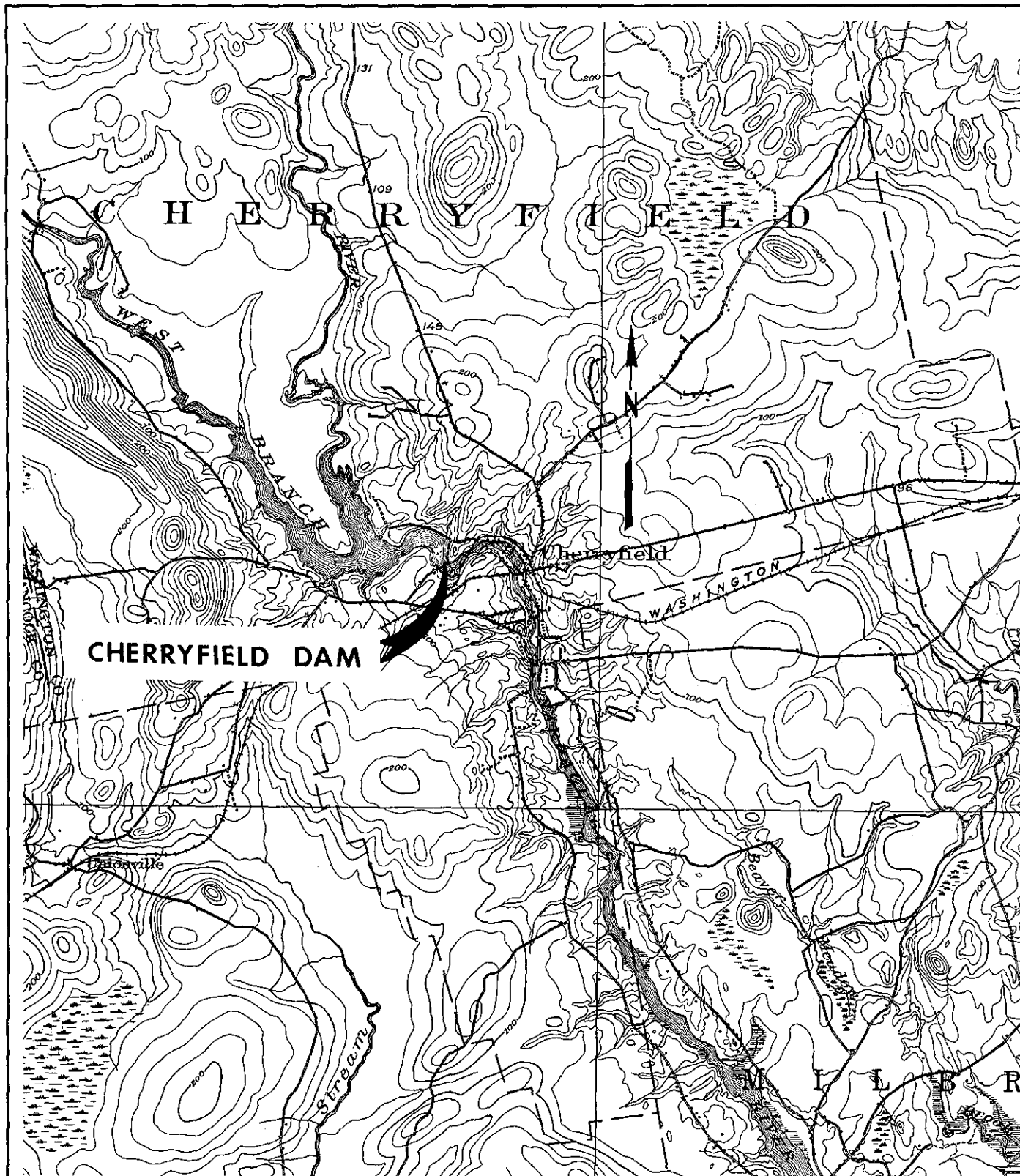
7.1 DAM ASSESSMENT.....	7-1
7.2 RECOMMENDATIONS.....	7-1
7.3 REMEDIAL MEASURES.....	7-1
7.4 ALTERNATIVES.....	7-2

APPENDICES

A	FIELD INSPECTION NOTES
B	ENGINEERING DATA
C	PHOTOGRAPHS
D	HYDROLOGIC AND HYDRAULIC COMPUTATIONS
E	INVENTORY FORMS



OVERVIEW



U.S. GEOLOGICAL SURVEY MAP
CHERRYFIELD, ME. QUADRANGLE

0 1 2 3 MILES

EDWARD C. JORDAN CO., INC. PORTLAND, MAINE		U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS			
CHERRYFIELD DAM LOCATION MAP			
NARRAGUAGUS RIVER		ME.	
20799 13	SCALE	AS SHOWN	
	DATE	MARCH 1979	

PHASE I INSPECTION REPORT

CHERRYFIELD DAM

SECTION 1

PROJECT INFORMATION

1.1 GENERAL

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Edward C. Jordan Co. Inc. has been retained by the New England Division to inspect and report on selected dams in the states of Maine and New Hampshire. Authorization and notice to proceed were issued to Edward C. Jordan Co., Inc. under a letter of December 1, 1978 from Max B. Scheider, Colonel, Corps of Engineers. Contract No. DACW33-79-C-0017 has been assigned by the Corps of Engineers for this work.

b. Purpose

- (1) To perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.
- (2) To encourage and prepare the states to initiate quickly effective dam safety programs for non-Federal dams.
- (3) To update, verify and complete the National Inventory of Dams.

1.2 DESCRIPTION OF PROJECT

a. Location. The Cherryfield Dam is located on the Narra-
guagus River in the town of Cherryfield, Maine. N 44°-
36.6', W 67°-56.3'.

b. Description of Dam and Appurtenances. The Cherryfield
Dam is a 24.5-foot high stone-filled timber crib and

earth embankment structure. It consists of stone-filled timber crib abutments, a stone-filled timber crib spillway section, and earthfill embankments. The dam is about 500 feet long including embankment sections. At each end of the spillway, adjacent to the abutments, sluiceways with stop logs have been provided to lower water levels for maintenance purposes. A Denil-type fishway has been constructed within the east abutment. About 125 feet upstream of the spillway, are located three independent rock-filled timber cribs. The individual cribs are placed in an arched pattern from abutment to abutment. Plan, profile and cross-sections are presented in Appendix B.

c. Size Classification. The Cherryfield Dam has a storage capacity of 26,000 acre-feet and a height of 24.5 feet. According to Corp of Engineer's "Recommended Guidelines for Safety Inspection of Dams," a dam with storage capacity greater than 1,000 acre-feet but less than 50,000 acre-feet or a height greater than 40 feet but less than 100 feet is classified as an intermediate size dam.

d. Hazard Classification. The Cherryfield Dam is classified as having a high hazard potential. The peak flow from hypothetical failure of the dam was estimated to be 33,600 cfs, based on procedures provided by the Corps of Engineers. Approximately 50 residential, commercial and industrial buildings in the town of Cherryfield would be flooded to depths ranging from 1 to 7 feet. In addition, approximately 10 buildings in the town of Milbridge would be flooded to depths ranging from 1 to 5 feet. It should be noted that since the spillway is uncontrolled, a significant flood event would be occurring if headwaters were to reach the top of the dam (elev. 73.5 feet). Prior to failure, flood depths at Cherryfield, Maine would range from 1 to 5 feet.

e. Ownership.

Current Owner: Town of Cherryfield
Town Office
Cherryfield, Maine
Tel: (207) 546-2376

Previous Owner: None

f. Operator.

Contact: Victor Grant, Town Manager

- g. Purpose of Dam. The Cherryfield Dam and reservoir are designed to retain river ice floes to prevent ice jam flooding in Cherryfield. The rock-filled timber cribs located upstream of the dam are designed to provide an anchor for the reservoir cover ice thus preventing the downstream movement of ice jams.
- h. Design and Construction History. The dam was designed by the U.S. Army Corps of Engineers, New England Division and constructed by Sanders Construction Corporation of Portland, Maine in 1961.
- i. Normal Operating Procedure. There are no normal operating functions to be performed at this dam except that under low flow conditions, stop logs are removed in the east sluiceway to insure a flow of water below the fishway.

1.3 PERTINENT DATA

- a. Drainage Area. The drainage area above Cherryfield Dam is approximately 232 square miles. The watershed is primarily forested with slopes varying from flat to moderate. There are approximately 5 square miles of lakes and ponds and 16 square miles of swamp and marsh land within the drainage area.
- b. Discharge at Damsite. The following pertinent discharges were estimated assuming water surface elevation at top of west embankment (elev. 73.5 ft MSL), unless otherwise noted.
 - (1) Spillway capacity - 24,000 cfs
 - (2) Sluiceway capacity (stop logs removed) - 300 cfs (each) at water surface elev. 57.6 ft
 - (3) Sluiceway capacity (stop logs in place, as observed during field inspection) - 4.6 cfs (each) at water surface elev. 57.6 ft
 - (4) Maximum historical flood discharge at damsite is unknown. A U.S.G.S. streamflow gauge, installed in February, 1948 and located 0.2 miles below the dam, recorded a discharge of 10,400 cfs on May 28, 1961. The "Detailed Project Report" prepared by Corps of Engineers gives a maximum river stage of 17.7 ft (MSL) at the Route 1 highway bridge located down-

stream of the dam. This stage was created by a combination of spring runoff (4,600 cfs), ice jams, and failure of an upstream dam (Stillwater Dam).

- (5) Total project discharge at test flood (1/2 PMF) - 27,000 cfs at elev. 74.5 ft.

c. Elevation.

Assuming spillway crest at a mean sea level elevation of 57.0 feet, the following elevations at the dam were determined using field survey data.

ITEM	APPROX. ELEV. ABOVE MSL
Top of dam - west earth embankment	73.5
east earth embankment	Varies from 74.5 to 76.0
Top of west abutment crib	74.5
Top of east abutment crib	75.0
1/2 PMF pool	74.5
Spillway crest	57.0
Full flood control pool	Not Applicable
Sluiceway invert - upstream end	53.2
- downstream end	52.5
Top of sluiceway stop logs (as observed during field inspection)	
- upstream control	57.0
- downstream control	54.0
Streambed at centerline of dam	50.0
Maximum tailwater	Unknown

d. Reservoir Reach.

ITEM	LENGTH (MILES)
Spillway crest	2.5
Top of dam (at west earth embankment)	5

e. Reservoir Storage Capacity.

ITEM	ACRE-FEET
Spillway crest	3,700
Top of west earth embankment	26,000
Test flood pool	52,000

f. Reservoir Surface Area.

ITEM	ACRES
Spillway crest	900
Top of west earth embankment	2,550
Test flood pool	3,240

g. Dam.

Type - The dam consists of rock-filled timber crib spillway and abutments with earth and rock-fill embankments at each end of the dam.

Length - Approximately 500 feet including east and west embankments.

Height - Maximum 24.5 feet from top of timber crib abutment to channel bed.

Top Width - See plan and cross-section drawings in Appendix B.

Side Slopes - See plan and cross-section drawings in Appendix B.

Zoning - See plan and cross-section drawings in Appendix B.

Impervious Core - None.

Cutoff - See plan and cross-section drawings in Appendix B.

Grout Curtain - None.

h. Diversion and Regulating Tunnel. Not applicable.

i. Spillway.

Type - The spillway is an uncontrolled, open channel, chute spillway. See cross-sections, Appendix B.

Length - 135 feet.

Crest Elevation - 57 (MSL).

Gates - None.

Downstream Channel - The channel of the Narraguagus River below the dam appeared moderately steep and very rocky. At the downstream end of the spillway, the river channel has been formed into a plunge pool and covered with a protective apron of stone.

j. Regulating Outlets.

- (1) Upstream invert - stop log sluiceways elev. 53.2
- (2) Size - Sluiceway - 3.5 feet wide (see plan and cross-section drawings in Appendix B).
- (3) Description - A 3.5 foot wide stop log sluiceway is located at each end of the spillway to provide drawdown for maintenance purposes. The east sluiceway delivers flow below the fishway during low river discharges.
- (4) Stop logs - manually operated.

SECTION 2

ENGINEERING DATA

2.1 DESIGN

The design data available for Cherryfield Dam is in the form of a "Detail Project Report" and an "Operation and Maintenance Manual", which includes hydrographs and rating curves, referenced in Appendix B.

2.2 CONSTRUCTION

The only construction data available for Cherryfield Dam is in the form of an "Operation and Maintenance Manual", which includes record drawings, referenced in Appendix B.

2.3 OPERATION

The Cherryfield Dam and reservoir were constructed to retain river ice flow to prevent ice jam flooding in the town of Cherryfield. No operating procedures are required for this dam other than low flow regulation for the fishway.

2.4 EVALUATION

- a. Availability. A copy of the "Detailed Project Report" and "Operation and Maintenance Manual" for Cherryfield Dam is on file at the U.S. Army Corps of Engineers, New England Headquarters, Waltham, Massachusetts.
- b. Adequacy. The engineering data available is deemed to be adequate for assessment of the structure.
- c. Validity. The physical dimensions of the various elements of the dam were measured by stadia survey, during the field inspection, and were found to generally agree with the available drawings.

SECTION 3
VISUAL INSPECTION

3.1 FINDINGS

a. General. The Cherryfield Dam is a stone-filled timber crib and earth embankment structure and is located in a narrow steep sided section of the Narraguagus River valley.

b. Dam.

- (1) See Appendix A for detail inspection findings and Appendix B for plan, profile and cross-sections.

The timber portions of the dam appear to be in excellent condition. The timber crib members were pressure treated prior to construction and presently show no evidence of deterioration. The timber planking on the interior surfaces of the fishway has been recently replaced and is in good condition.

The earth embankments appear to be in good condition. The riprap on the upstream face appears to be tight and true to line and grade. The downstream slopes are covered with 1 to 3-inch size crushed stone. Vehicle tracks were noted on the downstream slope of the west embankment. It was also noted that a sag of about 6 inches exists at the crest of the west embankment adjacent to the west abutment.

- (2) Hydraulics - During the initial inspection visit, water was flowing over the spillway crest at a depth of about 3 inches and flow was also occurring through the spillway. No debris was observed in either the upstream or downstream channels. The dam passes river flow over the uncontrolled chute spillway. The sluiceways located at each end of the spillway crest are provided with stop log control. The east sluiceway stop log elevation is normally kept 6 inches below that of the west sluiceway to provide flow to the fishway. Energy dissipation of spillway discharge is provided by a plunge pool and a 50-foot long downstream riprap apron. No significant scour was noted at the apron.

c. Appurtenant Structures. An outlet stop log sluiceway is located at each end of the spillway. There are four sets

of stop log slots in each bay (see cross-sections in Appendix B). The downstream set of stop logs was not in place in the west sluiceway.

There are three stone-filled timber crib piers located upstream of the dam. The timber appears to be in good condition. However, the stone fill in the center pier has apparently settled or been washed out leaving the rock fill surface below the top of the pier.

A denil-type fishway has been constructed integrally with the east abutment crib. A fishway sluice gate with manually operated hoist equipment is located approximately 4 feet from the upstream end of the fishway. The fishway appears to be in good condition.

d. Reservoir Area. The reservoir shoreline is primarily forested. Ground slopes adjacent to the reservoir are flat to moderate. No evidence of recent landslide activity was observed. There are three rock-filled timber cribs in the reservoir area located in the main stream channel approximately 125 feet above the dam. The cribs are placed in an arched fashion from abutment to abutment.

e. Downstream Channel. The channel of the Narraguagus River below the dam appeared moderately steep and very rocky. At the downstream end of the spillway, the river channel has been formed into a plunge pool and covered with a protective riprap apron. Just below the dam, the river makes a 90° bend to the east and slightly further downstream, a 90° bend to the south. The overbank areas are sparsely to moderately wooded with a moderate growth of underbrush.

3.2 EVALUATION

Based on the visual inspection findings, the Cherryfield Dam appears to be in good condition. The timber elements and embankments show no evidence of serious distress. As outlined in Section 7, however, some maintenance is necessary to assure long-term integrity of the structure.

SECTION 4

OPERATING PROCEDURES

4.1 PROCEDURES

Since there are no operational gateworks at the dam, except the appurtenant fishway, the major provision for discharge from the reservoir is over the uncontrolled, chute spillway. Stop log sluiceways are provided at each end of the spillway for reservoir drawdown to facilitate maintenance and to enhance fishway circulation.

4.2 MAINTENANCE OF DAM

Reportedly, maintenance is performed on an as-needed basis. It appears that maintenance of the structure in recent years has consisted of the replacing of timber planking on the interior surfaces of the fishway.

According to the operation and maintenance manual, the dam is to be "inspected" before and after high flows and visits are required at least once every 90 days.

4.3 MAINTENANCE OF OPERATING FACILITIES

Not applicable.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

No warning system is known to be in effect.

4.5 EVALUATION

Current maintenance and operating procedures should be continued. No established surveillance or flood warning system is in effect.

SECTION 5
HYDROLOGIC/HYDRAULIC

5.1 EVALUATION OF FEATURES

- a. General. The Cherryfield Dam is a stone-filled timber crib and earth embankment structure with a timber crib spillway and abutments. The spillway is an uncontrolled, chute structure with parallel sidewalls at both the inlet and discharge channels. The project was designed to prevent downstream flooding caused by ice jams and not to provide water storage. The dam helps prevent ice jams in Cherryfield by creating a 3-1/2 mile long reservoir, where sheet ice is allowed to accumulate at sufficient depths to provide a barrier to river ice flows. Normally the reservoir would either retain the ice until it melted away in the spring or delay its downstream movement until after the breakup of ice in the 5-mile tidal reach between Cherryfield and Milbridge. The dam would also diminish the quantity of ice since little or no frazile ice (high density ice created by fast, turbulent waters) passes through pools or reservoirs. It is believed that this frazil ice, because it submerges readily and accumulates underneath the sheet ice, has lead to ice depths at reported thicknesses of 7 to 8 feet in the Cherryfield area in past years, prior to construction of the dam. All flows are discharged at the spillway. A Denil fishway has been built into the east abutment.
- b. Design Data. Cherryfield Dam was designed by the U.S. Army Corps of Engineers, New England Division. The dam and appurtenant structures were designed to prevent floods produced by ice jams at the town of Cherryfield. Hydrologic and hydraulic data available for evaluation consisted of information contained in the "Detailed Project Report." Data on floods of record are given in this report. The project design flood was assigned a discharge of 15,000 cfs allowing a freeboard of 3.7 feet. The design discharge of 15,000 cfs gives the spillway 50% more capacity than the May, 1923 or May, 1961 floods. The peak discharge of the Standard Project Flood (SPF) was computed to be 24,600 cfs when not solely considering floods resulting from ice build-up. However, it was decided that since flood control for high discharges was not to be a basic function of the project, to design for the SPF was unwarranted.

The hydraulic design of the spillway weir was based on a discharge coefficient "C" of 2.64 with a breadth of crest of 10 feet. At the design discharge, the resulting average velocity downstream would be 7 feet per second.

- c. Experience Data. No information regarding the operation of the dam during flood discharges was disclosed. The U.S.G.S. maintains a streamflow gauge 0.2 miles downstream of the dam. The gauge was installed in February, 1948. The maximum discharge recorded at the gauge to date is 10,400 cfs on May 28, 1961. Flooding at the town of Cherryfield is usually caused by a combination of ice buildup and spring runoff, rather than by river flow alone. The highest river stage noted on the Narraguagus River at the town of Cherryfield occurred in March, 1942. The river stage of 17.7 feet occurred at the Route 1 bridge, located below the dam. The flood was a combination of ice buildup, spring runoff (4600 cfs) and failure of an upstream dam.
- d. Visual Observations. Flow of the Narraguagus River is discharged at the uncontrolled spillway. The project was not designed to provide water storage. During the field inspection, the following observations of the hydraulic characteristics of the dam were made: 1) energy dissipation appeared adequate; 2) proper development of the hydraulic jump could not be evaluated because of the very low discharge occurring at the time of inspection; 3) no significant erosion of the earth embankments was noted; and 4) the outlet channel was clear and unobstructed. There was no evidence of previous overtopping.
- e. Test Flood Analysis. The Cherryfield Dam is classified as having a high hazard potential. Based on the Corps of Engineers' "Recommended Guidelines for Safety Inspection of Dams," a test flood equal to the probable maximum flood (PMF), developed in Appendix D, was used in evaluating the spillway capacity of the dam. The 232-square mile drainage area is characterized as flat. Using Corps of Engineers' "Preliminary Guidance for Estimating Maximum Probable Discharges," the test flood produces a peak inflow of 69,600 cfs. Due to the effect of surcharge storage in the reservoir, the routed PMF peak discharge at the dam is approximately 55,000 cfs. The spillway is capable of discharging 24,000 cfs without overtopping the dam. During the test flood event, water would overtop the dam by 7.0 feet at the west earth embankment.

f. Dam Failure Analysis. To determine the hazard classification for the Cherryfield Dam, the potential impact of failure of the dam at maximum pool was assessed. The failure analysis relied upon the Corps of Engineers' "rule of thumb" guidelines. The hazard potential was determined by calculating downstream dam failure hydrographs which might result from a breach of the east earth embankment section of the dam.

The flood peak at the dam from failure was computed to be 33,600 cfs. It would take the reservoir approximately 18 to 20 hours to empty. At a distance of approximately 1 mile downstream of the dam (at the town of Cherryfield), the peak flow from failure would result in a river stage of 11 to 12 feet. Just prior to failure, river stage would be approximately 10 feet. At a distance of 5.7 miles below the dam (just above the town of Milbridge, Maine), the peak flow from failure would be reduced to about 27,000 cfs with resulting river stages of 10 to 11 feet. Prior to failure, river stage above the town of Milbridge would be about 9 ft with a flow of 20,000 cfs.

The estimated peak flow resulting from failure would cause additional damage to approximately 50 residential, commercial, and industrial buildings in the town of Cherryfield, Maine. There would be potential for loss of lives. The failure would also result in damage to approximately 10 residential buildings in the town of Milbridge, Maine. Flood depths of 1 to 7 feet would occur in Cherryfield, Maine and 1 to 5 feet in Milbridge, Maine. It is noted that using the Corps of Engineers' guidelines for evaluating dam failures assumes breach of the dam occurs with water level at top of dam. In the case of Cherryfield Dam, which has an uncontrolled spillway, when water level is at top of dam a significant flood event would already be occurring downstream. Flood depths just prior to failure would range from 1 to 5 feet in the town of Cherryfield, Maine.

Based on the fact that flood levels resulting from failure of the dam would increase 1 to 2 feet above those that existed just prior to failure, the Cherryfield Dam is judged to be a high hazard potential dam.

The earth embankment sections of the dam would not be highly resistant to erosion during sustained periods of overtopping.

SECTION 6

STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

- a. Visual Observations. Based on the visual inspection findings, the Cherryfield Dam appears to be in good condition. The timber elements show no evidence of deterioration. A 6-inch sag has occurred at the crest of the west embankment adjacent to the west abutment. This settlement appears to be due to consolidation of the embankment materials since construction, and not to undermining or erosion.
- b. Design and Construction Data. Record drawings of the structure were made available by the Corps of Engineers. The visual inspection findings agree with the drawings. Design computations, including stability analyses, were also made available for this investigation.
- c. Operating Records. Design operating procedures for the structure are included in the "Operation and Maintenance Manual." The procedures include inspection and maintenance intervals as well as operation procedures for low and high flow conditions.
- d. Post-Construction Changes. None.
- e. Seismic Stability. The dam is located in Seismic Zone No. 1 and in accordance with recommended Phase I guidelines, does not warrant seismic analysis.

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 DAM ASSESSMENT

- a. Condition. Based on the visual inspection and performance history of the Cherryfield Dam, it is assessed to be in good condition. The spillway and storage capacity of the dam is insufficient to pass the test flood without overtopping. With respect to the hydraulics of flow, the spillway appears adequately designed. The visual inspection resulted in the following concerns:
- (1) Some settlement has occurred in the west embankment adjacent to the west abutment. This results in a low section in the embankment crest.
 - (2) The stop logs are not in place in the downstream end of the west sluiceway. The sluiceway is somewhat more vulnerable to ice damage with the resulting lowered water level.
 - (3) The center pier upstream of the dam appears to have stones missing. Loss of weight in the pier makes it more vulnerable to ice damage.
- b. Adequacy of Information. The information available is deemed adequate for assessment of the project.
- c. Urgency. The remedial measures outlined in Section 7.3 below should be implemented within 2 years after receipt of this report by the owner.
- d. Need for Additional Investigation. Additional investigation is not considered necessary for the current assessment.

7.2 RECOMMENDATIONS

None.

7.3 REMEDIAL MEASURES

- a. Operation and Maintenance Procedures. The program of regular inspection and maintenance should be continued and a record of the activities should be kept. The

following specific operation and maintenance procedures should be implemented:

- (1) The sag in the west embankment should be filled and brought to grade.
- (2) Stop logs should be installed in the downstream section of the west sluiceway.
- (3) The center pier upstream of the dam should be refilled to grade with stones.
- (4) Develop a formal warning system and implement its use in the event of an emergency.

7.4 ALTERNATIVES

Not applicable.

APPENDIX A
VISUAL INSPECTION CHECKLIST
AND
SUPPLEMENTARY INSPECTION NOTES

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT Cherryfield Dam

DATE 11/29/78

TIME A.M.

WEATHER Sunny, cool
3" snow on ground

W.S. ELEV. 57.25[±] U.S. 53.25[±] DN.S.

PARTY:

- | | |
|---------------------------|-------------|
| 1. <u>Stephen Cole</u> | 6. <u></u> |
| 2. <u>Brian Bisson</u> | 7. <u></u> |
| 3. <u>Scott Decker</u> | 8. <u></u> |
| 4. <u>John Kimble</u> | 9. <u></u> |
| 5. <u>Charles Goodwin</u> | 10. <u></u> |

PROJECT FEATURE	INSPECTED BY	REMARKS
1. <u>Geotechnical</u>	<u>Cole</u>	
2. <u>Structural</u>	<u>Cole, Decker</u>	
3. <u>Hydraulics/Hydrology</u>	<u>Bisson</u>	
4. <u>Civil</u>	<u>Decker</u>	
5. <u>Survey</u>	<u>Kimble, Goodwin</u>	
6. <u>Photography</u>	<u>Decker, Bisson</u>	
<u>Review</u>	<u>S. Walker, Charles Horstmann</u>	
<u>Inspection 12/14/78</u>	<u>No significant differences were observed.</u>	

NOTE: See Supplementary Inspection Notes Following Checklist

INSPECTION CHECKLIST

PROJECT Cherryfield Dam DATE 11/29/78
 PROJECT FEATURE Embankment NAME Cole
 DISCIPLINE Geotechnical NAME _____

AREA EVALUATED	CONDITIONS
<u>DAM EMBANKMENT</u>	
Crest Elevation	75 ±
Current Pool Elevation	57.25
Maximum Impoundment to Date	Unknown
Surface Cracks	None
Pavement Condition	Gravel on crest, okay
Movement or Settlement of Crest	Minor sag near west abutment
Lateral Movement	None
Vertical Alignment	Good except for sag noted above
Horizontal Alignment	Good
Condition at Abutment and at Timber Structures	Good
Indications of Movement of Structural Items on Slopes	None
Trespassing on Slopes	Vehicle tracks on downstream slope, west embankment
Sloughing or Erosion of Slopes or Abutments	None
Vegetation	None

AREA EVALUATED	CONDITIONS
<u>DAM EMBANKMENT</u> (cont.)	
Rock Slope Protection - Riprap Failures	Minor sag at downstream toe near east abutment
Unusual Embankment or Downstream Seepage	None
Piping or Boils	None
Foundation Drainage Features	None
Toe Drains	None
Instrumentation System	None

INSPECTION CHECKLIST

PROJECT Cherryfield Dam DATE 11/29/78
 PROJECT FEATURE Inlet Channel/Structure NAME Cole, Decker
 DISCIPLINE Structural/Geotechnical NAME Bisson
Hydraulics/Hydrology

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - INTAKE CHANNEL AND</u> <u>INTAKE STRUCTURE</u>	
a. Approach Channel	
Slope Conditions	Flat, okay
Bottom Conditions	Gravel, cobbles, clear
Rock Slides or Falls	None
Log Boom	None
Debris	None
Condition of Concrete Lining	None
Drains or Weep Holes	None
b. Intake Structure	
Condition of Timber	Good
Stop Logs and Slots	Good

NOTE: Outlet structure consists of stop log bays at both ends of spillway.

INSPECTION CHECKLIST

PROJECT Cherryfield Dam

DATE 11/29/78

PROJECT FEATURE Control Tower

NAME Cole

DISCIPLINE Structural

NAME Decker

AREA EVALUATED	CONDITION
----------------	-----------

OUTLET WORKS - CONTROL TOWER

a. Masonry and Structural

General Condition

Condition of Joints

Spalling

Visible Reinforcing

NOT APPLICABLE

Rusting or Staining of Concrete

Any Seepage or Efflorescence

Joint Alignment

Unusual Seepage or Leaks in Gate Chamber

Cracks

Rusting or Corrosion of Steel

b. Mechanical and Electrical

Air Vents

Float Wells

Gate Hoist

Elevator

AREA EVALUATED	CONDITIONS
<u>OUTLET WORKS - CONTROL TOWER (cont.)</u>	
Hydraulic System	NOT APPLICABLE
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System	

INSPECTION CHECKLIST

PROJECT Cherryfield Dam DATE 11/29/78
 PROJECT FEATURE Transition & Conduit NAME Cole
 DISCIPLINE Structural NAME Decker, Bisson

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - TRANSITION AND CONDUIT</u>	
General Condition of Timber	Good
Rust or Staining on Concrete	N/A
Spalling	N/A
Erosion or Cavitation	N/A
Cracking	N/A
Alignment of Monoliths	N/A
Alignment of Joints	N/A
Numbering of Monoliths	N/A

PERIODIC INSPECTION CHECKLIST

PROJECT Cherryfield Dam DATE 11/29/78
 PROJECT FEATURE Outlet Structure/Channel NAME Cole, Decker
 DISCIPLINE Structural, Geotechnical NAME Bisson
Hydrology/Hydraulics

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - OUTLET STRUCTURE AND</u> <u>OUTLET CHANNEL</u>	
General Condition of Timber	Good
Rust or Staining	Not applicable
Spalling	Not applicable
Erosion or Cavitation	Not applicable
Visible Reinforcing	Not applicable
Any Seepage or Efflorescence	None apparent
Condition at Joints	Good
Drain holes	None
Channel	
Loose Rock or Trees Overhanging Channel	None
Condition of Discharge Channel	Appears good, minor scour

NOTE: Stop logs not in place at
outlet end of west sluiceway.

INSPECTION CHECKLIST

PROJECT Cherryfield Dam DATE 11/29/78
 PROJECT FEATURE Spillway NAME Cole, Decker
 DISCIPLINE Structural, Hydraulics/Hydrology NAME Bisson

AREA EVALUATED	CONDITION
----------------	-----------

OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS

- a. Approach Channel NOTE: Three piers in approach channel
- | | |
|--------------------------------|------------------------|
| General Condition | Good |
| Loose Rock Overhanging Channel | None |
| Trees Overhanging Channel | None |
| Floor of Approach Channel | Gravel, cobbles, clear |
- b. Weir and Training Walls
- | | |
|------------------------------|--------------|
| General Condition of Timber | Good |
| Rust or Staining | N/A |
| Spalling | N/A |
| Any Visible Reinforcing | N/A |
| Any Seepage or Efflorescence | None evident |
| Drain Holes | None |
- c. Discharge Channel
- | | |
|--------------------------------|------------------------------|
| General Condition | Good, minor scour |
| Loose Rock Overhanging Channel | None |
| Trees Overhanging Channel | None |
| Floor of Channel | Gravel, cobbles, minor scour |
| Other Obstructions | None |

INSPECTION CHECKLIST

PROJECT Cherryfield Dam DATE 11/29/78
 PROJECT FEATURE Service Bridge NAME Decker
 DISCIPLINE Civil NAME _____

AREA EVALUATED	CONDITION
----------------	-----------

OUTLET WORKS - SERVICE BRIDGE

a. Superstructure

Bearings

Anchor Bolts

Bridge Seat

Longitudinal Members

Under Side of Deck

NOT APPLICABLE

Secondary Bracing

Deck

Drainage System

Railings

Expansion Joints

Paint

b. Abutment & Piers

General Condition of Concrete

Alignment of Abutment

Approach to Bridge

Condition of Seat & Backwall

SUPPLEMENTARY INSPECTION NOTES

CHERRYFIELD DAM

CHERRYFIELD, MAINE

APPENDIX A

1. TIMBER STRUCTURES IN GENERAL

- a. Timber Surfaces. The surfaces of the timber members of the Cherryfield Dam were found to be in excellent condition, with no evidence of deterioration. The timber is pressure-treated everywhere except in the interior faces of the fishway, where the timber is untreated.
- b. Movement, Horizontal and Vertical Alignment. The timber cribs and the timber spillway section of the dam appear true to line and grade with no evidence of horizontal or vertical movement.
- c. Junctions. The junctions between the timber abutments and the earth embankment sections were found to be in generally good condition. There appears to be some settlement (in the order of 6 inches) between the west abutment and the embankment. The junctions between the abutments and sluiceways and the sluiceway and spillway appear to be in good condition with no apparent movement or distress.
- d. Drains. There are apparently no formal drainage systems in the dam. The downstream face of the timber cribs are open allowing for drainage.
- e. Water Passages. The surface of the spillway and the interior surfaces of the controlled outlet sluiceways were found to be in good condition with no visible evidence of serious scour to the surface of the timber. The interior surface of the fishway section was also found to be in good condition with no evidence of surface scour.
- f. Seepage or Leakage. There appeared to be no abnormal or unusual seepage or leakage at the toe of the abutments, beneath or around any of the timber sections of the dam.

- g. Joints. The joints in the timber cribwork were found to be in good condition with no indication of distress.
- h. Foundation. The dam appeared to be founded on soil and not bedrock. However, there appears to be no erosion or undermining of the dam.
- i. Abutments. The embankment sections end at timber crib abutments on each side of the river. These abutments were found to be in good condition.

2. EMBANKMENT STRUCTURES

No general or localized settlement was observed in the east embankment. An area adjacent to the west abutment shows evidence of some general settlement. This appears to be long-term settlement, apparently due to consolidation of the embankment materials and does not appear to be related to undermining or erosion of the embankment material.

- a. Slope Stability. The embankment slopes are smooth and uniform and appear to be true to line and grade. There is no evidence of instability of the slopes.
- b. Seepage. No evidence of seepage was observed along or beyond the downstream face or downstream toe of the embankments.
- c. Drainage Systems. No drainage systems were observed at the dam structure.
- d. Slope Protection. The upstream slope of both the north and south embankments is protected with riprap which appears to be in very good condition with no erosion or displacement evident. The downstream slopes are covered with crushed stone ranging in size from one inch to approximately three inches. There is no evidence of erosion or displacement of this downstream slope cover. The presence of small stumps indicated that some brush growth has previously occurred in both the upstream and downstream slopes, however, at the time of inspection there was no growth.

3. SPILLWAY STRUCTURES

The spillway consists of a timber open channel chute structure.

- a. Control Gates and Operating Machinery. None.
- b. Unlined Saddle Spillway. None.
- c. Approach and Outlet Channels. The approach channel to the spillway contains three rock-fill timber crib structures constructed to provide an anchor for the collection and holding of sheet ice in the reservoir. The channel was otherwise clear and unobstructed. The outlet channel is moderately steep and very rocky. The Narraguagus River makes two sweeping bends just below the dam. The outlet channel is generally clear and unobstructed.
- d. Stilling Basin. The stilling basin consists of a 50-foot long horizontal apron constructed of gravels and stone. Detailed inspection of the stilling basin was not possible due to tailwater level. The apron apparently promotes the development of a hydraulic jump which provides energy dissipation.

4. OUTLET WORKS

A stop log controlled outlet sluiceway exists at each end of the spillway adjacent to the training walls.

- a. Intake Structures. The inlet structures on both outlets consist of timber and were found to be in good condition with no debris restricting their opening.
- b. Operating and Emergency Control Gates. Both controlled outlets are controlled by four sets of stop logs. The stop logs were found to be in generally good condition, however, on the downstream end of the west outlet the stop logs were missing.

5. CONDUITS, SLUICES AND WATER PASSAGES

The controlled outlet sluiceways have a timber surface which was found to be in good condition.

- a. Stilling Basin. The stilling basin consists of the natural streambed downstream of both outlet structures. Minor erosion and scour has occurred downstream of both outlets.
- b. Approach and Outlet Channels. Approach and outlet channels to both outlet structures were found to be clear and unobstructed.

6. SAFETY PERFORMANCE INSTRUMENTATION

None.

7. RESERVOIR

- a. Shoreline. Shoreline is primarily forested with ground slopes flat to moderate. No recent earth movements along the shoreline were observed.
- b. Sedimentation. The extent of sedimentation is unknown (could not be observed), however, it does not appear to impede flow to the spillway.
- c. Potential Upstream Hazard. There is no significant hazard.
- d. Watershed Runoff Potential. Due to flat to moderate slopes, predominance of forest cover, and many small lakes in headwaters, watershed runoff potential is judged to be low to moderate.

8. OPERATION AND MAINTENANCE FEATURES

- a. Maintenance. It was observed that the dam is maintained on an as-needed basis and it was reported by Mariner Dennison, town selectman, that the dam is frequently inspected by the town of Cherryfield and maintenance is performed as needed.

APPENDIX B

ENGINEERING DATA

This appendix lists the engineering data collected either from project records or other sources of data developed as a result of the visual inspection. The contents of this appendix are listed below.

<u>Appendix</u>	<u>Description</u>
B-1	General Project Data

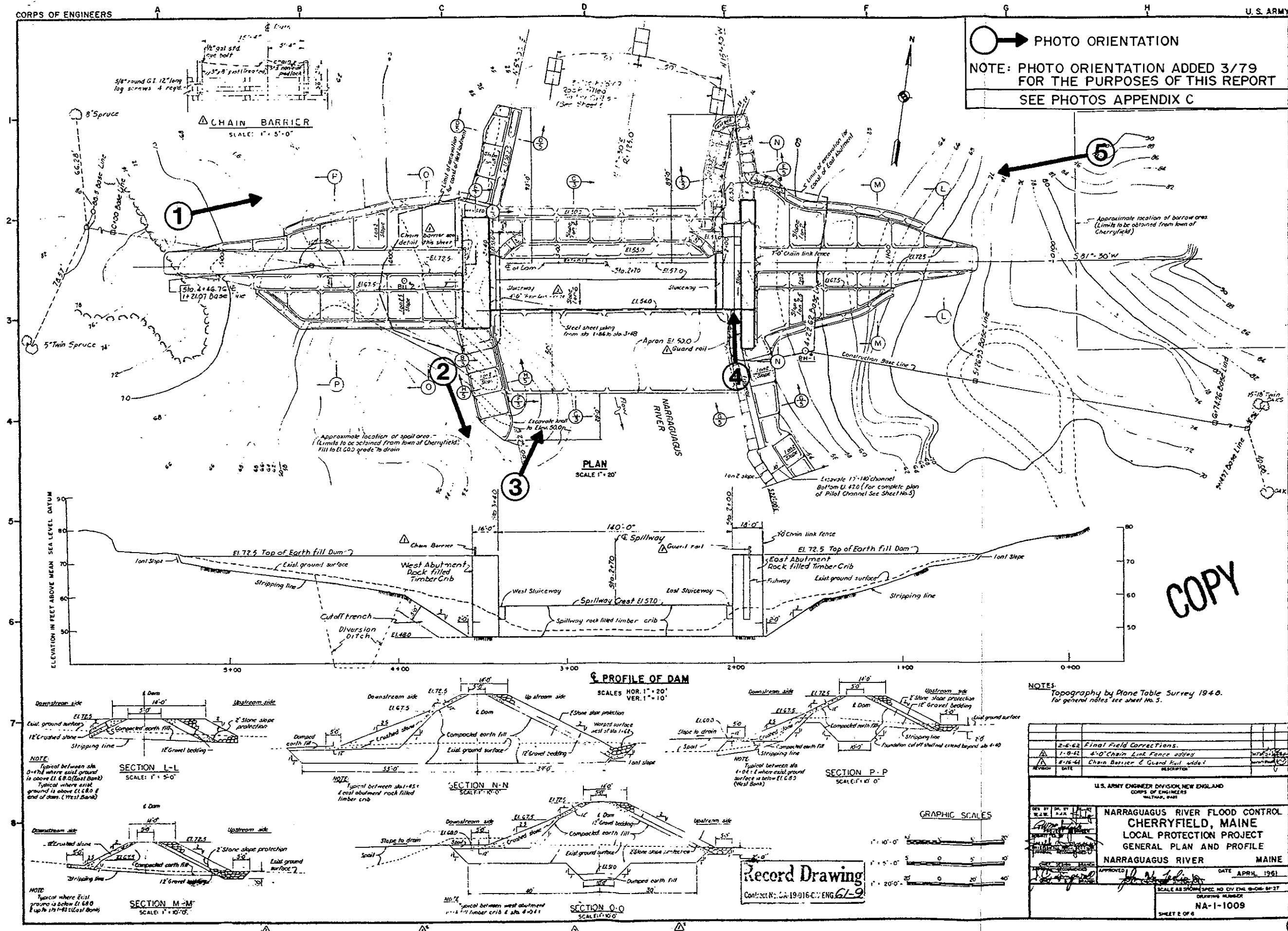
APPENDIX B-1

GENERAL PROJECT DATA

The following material is available at the office of the U.S. Army Corps of Engineers, New England Headquarters, Waltham, Massachusetts.

- A. Periodic inspection reports.
- B. Copy of the Corps of Engineers' "Operation and Maintenance Manual" for Cherryfield Dam which includes copies of record drawings, hydrographs, and rating curves.
- C. Copy of Corps of Engineers "Detailed Project Report" for Cherryfield Dam.

The following plan, profile and cross-section record drawings of the dam were taken from the Corps of Engineers "Operation and Maintenance Manual" for Cherryfield Dam.





APPENDIX C

PHOTOGRAPHS

The following are photographs referenced in this report. See Sheet B-1 for photograph locations and orientations.



1

VIEW FROM WEST END OF DAM



2

DOWNSTREAM CHANNEL



3

DOWNSTREAM FACE



4

DENIL-FISHWAY AT EAST ABUTMENT



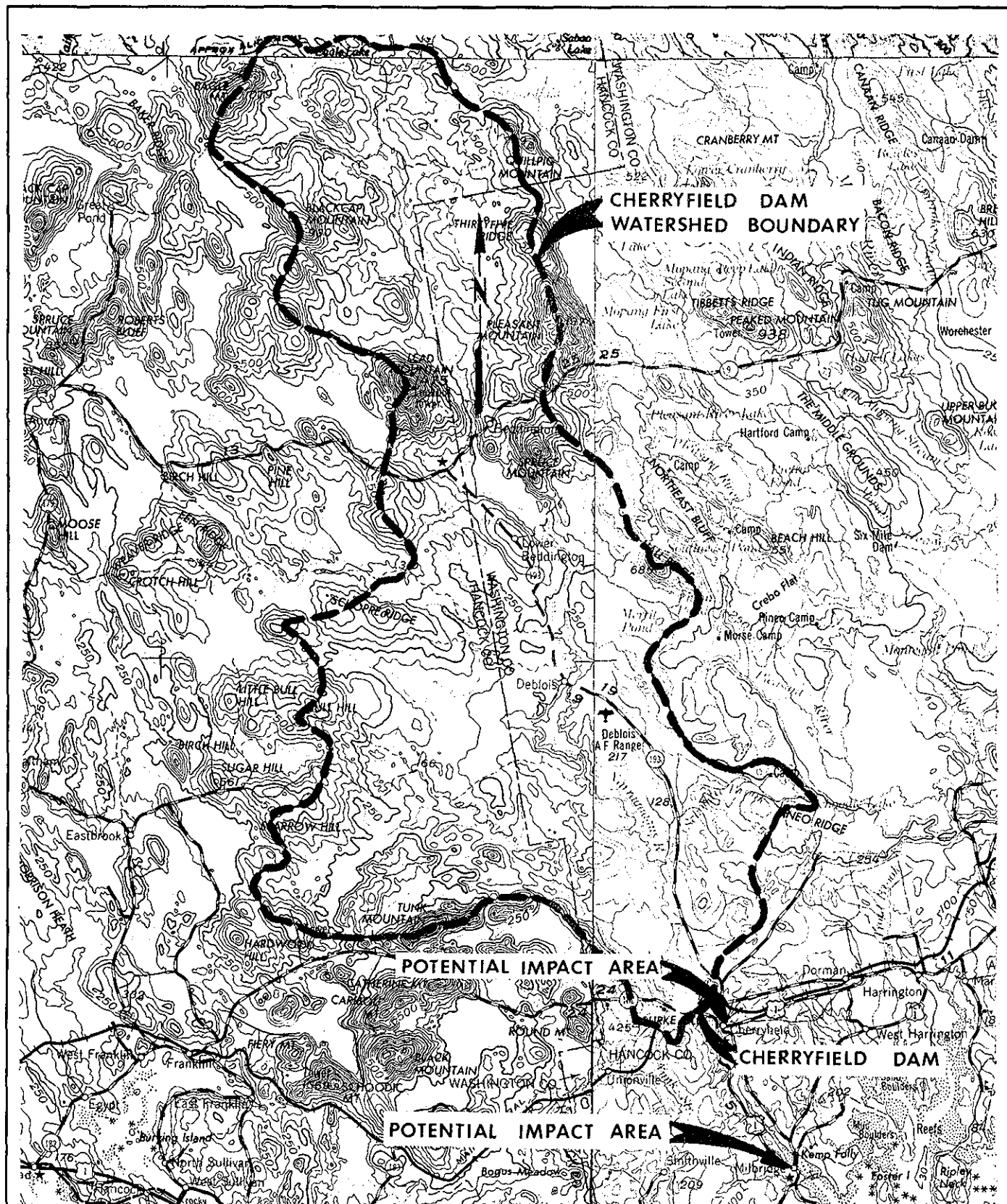
5

VIEW FROM EAST END OF DAM

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

Hydrologic computations pertinent to this investigation are attached. The following figure shows the Narraguagus River watershed at the Cherryfield Dam.



U.S. GEOLOGICAL SURVEY MAP
BANGOR, ME. QUADRANGLE
EASTPORT, ME. QUADRANGLE

10 5 10 15 MILES

EDWARD C. JORDAN CO., INC. PORTLAND, MAINE		U.S. ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS			
CHERRYFIELD DAM DRAINAGE AREA MAP			
NARRAGUAGUS RIVER		MAINE	
2079913		SCALE	AS SHOWN
		DATE	MARCH 1979

PROJECT
CHERRYFIELD DAM
TIE INTO MEAN SEA LEVEL ELEVATIONS

COMP. BY
JJD
CHK. BY
BTD

JOB NO.
20799-13
DATE
2/6/79

USING A CORPS OF ENGINEERS' PRE-CONSTRUCTION DRAWING,
THE SPILLWAY CREST IS AT ELEV 57.0 FT M.S.L. ACCORDING TO THE
DRAWINGS. THE FOLLOWING PERTINENT ELEVS. WERE GIVEN AT THE

DAM :

ITEM	SURVEY ELEV.	M.S.L. ELEV
SPILLWAY CREST	82.0	57.0
TOP OF WEST ABUTMENT CRIB	99.5	74.5
" " EAST " CRIBS	100.0	75.0
DOWNSTREAM SLUICeway INVERTS	77.5	52.5
TOP OF WEST EARTH EMBANKMENT	98.5	73.5
" " EAST " "	VARIES	VARIES
DOWNSTREAM STREAMBED	75.0 ±	50.0 ±



PROJECT

CHERRYFIELD DAM

HYDRAULICS

COMP. BY

JJD

CHK. BY

BTB

JOB NO.

20799-13

DATE

2/6/79

DISCHARGE CAPACITY OF DAMA. SPILLWAY CAPACITY - UNCONTROLLED, OPEN CHANNEL CHUTE SPILLWAY

THE FOLLOWING SPILLWAY RATING CURVE WAS OBTAINED FROM

THE CORPS OF ENGINEERS "OPERATION AND MAINTENANCE MANUAL"

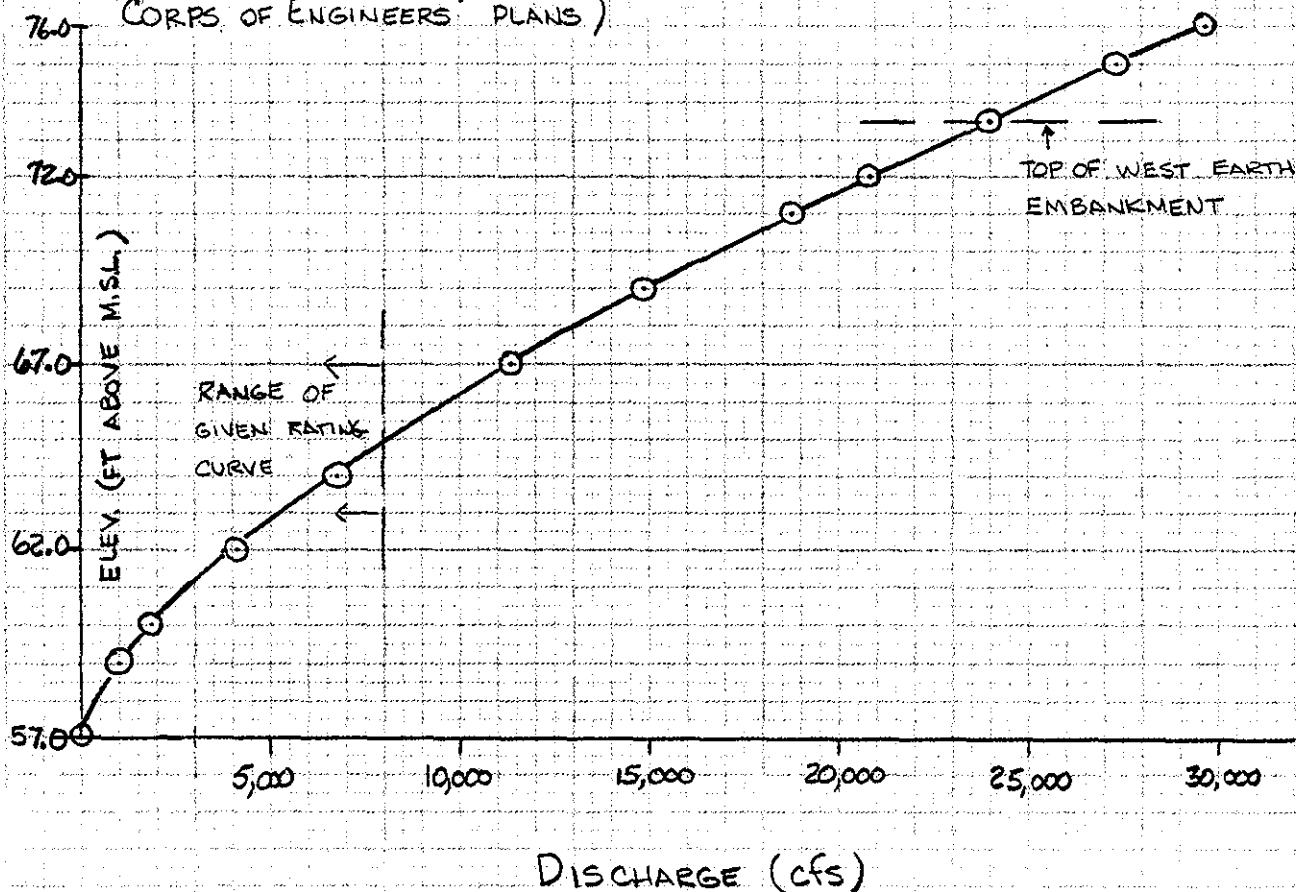
FOR THE STRUCTURE. FOR ELEVATIONS GREATER THAN 64 FT. M.S.L.,

DISCHARGE VALUES WERE ESTIMATED USING A "C" VALUE OF 2.65.

THIS "C" VALUE WAS OBTAINED BY ANALYSIS OF THE GIVEN RATING

CURVE. WITH AN ADJUSTED LENGTH OF 140 FEET (SPILLWAY LENGTH ON

CORPS OF ENGINEERS' PLANS)



USING A LENGTH OF 135 FT. ASSUMES THAT SLUICWAYS AT EITHER END OF THE SPILLWAY ARE SPILLWAY SECTIONS WHEN WATER ¹⁵ ABOVE SPILLWAY CREST. AT ELEV = 80 FT, $Q = 39,460$ CFS.

D-4

Cherryfield Dam

B. STOP LOG SLUICWAYS

(1) WITH STOP LOGS AS OBSERVED DURING FIELD INSPECTION AND

ASSUMING UPSTREAM (INLET) CONTROL:

AT WAT. SUR. ELEV. = 57.6 AND TOP OF STOP LOGS AT

INLET = 57.0, $H = 0.6$ FEET (Note: SLUICWAY AND SPILL-

WAY ARE SEPARATED BY A TIMBER BERM WITH TOP ELEV OF 57.6 FT,

AT ELEV > 57.6, SPILLWAY AND SLUICWAY ACT AS A SINGLE UNIT)

$$Q = CLH^{3/2}, \text{ WHERE } L = 3.5 \text{ FT}$$

$$C \approx 2.8 \text{ est.}$$

$$Q = 4.6 \text{ cfs AT EACH SLUICWAY}$$

(2) WITH ALL STOP LOGS REMOVED:

ASSUMING INLET CONTROL AND INLET INVERT = 53.2 FT

$$Q = \frac{1.486 AR^{4/3} S^{1/2}}{\eta}$$

$$\eta = .013 \text{ FOR } \text{SMOOTH WOOD PLANKING}$$

$$S = 1/48 = .0208 \text{ (FROM AS-BUILT DRAWINGS)}$$

AT W.S. ELEV = 57.6 FT

$$Q = \frac{1.486}{.013} (15.4)(1.25)^{2/3} (.0208)^{1/2} \approx 300 \text{ cfs AT EACH SLUICWAY}$$



C. DISCHARGE AT NON-OVERFLOW SECTIONS

(1) WEST EARTH EMBANKMENT (TOP OF EMBANKMENT = 73.5 FT M.S.L.)

DATA:

- CREST WIDTH = 10 FT
- SLOPE, UPSTREAM = 2H:1V
- SLOPE, DOWNSTREAM = 2H:1V
- LENGTH = 155 FT

ASSUME $C = 2.64$

M.S.L. ELEV.	SURVEY ELEV.	H	C	L	Q
73.5	98.5	0	2.64	155	0
74.0	99.0	0.5	"	"	145
75.0	100.0	1.5	"	"	752
76.0	101.0	2.5	"	"	1,617
77.0	102.0	3.5	"	"	2,679
78.0		4.5	"	"	3,906
79.0		5.5	"	"	5,278
80.0	105.0	6.5	"	"	6,781
82.0		8.5	"	"	10,140
84.0	109.0	10.5	"	"	13,923

(2) EAST EARTH EMBANKMENT (TOP OF EMBANKMENT VARIES FROM 74.5 FT M.S.L. TO 76.0 FT M.S.L., ASSUME CREST AT 75.0 FT M.S.L.)

M.S.L. ELEV.	SURVEY ELEV.	H	C	L	Q
75.0	100.0	0	2.64	160	0
76.0		1.0	"	"	422
77.0	102.0	2.0	"	"	1,195
78.0		3.0	"	"	2,195
79.0		4.0	"	"	3,379
80.0	105.0	5.0	"	"	4,722
82.0		7.0	"	"	7,823
84.0		9.0	"	"	11,405

(3) WEST ABUTMENT CRIB (TOP OF CRIB AT 74.5 FT)

M.S.L.	H	C	L	Q	M.S.L.	H	C	L	Q
74.5	0	2.64	16	0	77.0	2.5	2.64	16	167
75.0	0.5	"	"	15	78.0	3.5	"	"	276
76.0	1.5	"	"	76	80.0	5.5	"	"	545

NEGLIGIBLE

PROJECT
CHERRYFIELD DAM
HYDRAULICS

COMP. BY
JJD
CHK. BY
BTR

JOB NO.
20799-13
DATE
3/6/79

(4) EAST ABUTMENT CRIBS (TOP OF CRIBS AT 75.0 FT M.S.L.)

	M.S.L. ELEV	SURVEY ELEV	H	C	L	Q
NEGLECTIBLE ↓	75.0	100.0	0	2.64	20'	0
	76.0		1.0	"	"	53
	77.0	102.0	2.0	"	"	149
	78.0		3.0	"	"	274
	79.0	104.0	4.0	"	"	422
	80.0	105.0	5.0	"	"	590



PROJECT

CHERRYFIELD DAM

AREA - CAPACITY DATA

COMP. BY

JJD

CHK. BY

BTB

JOB NO.

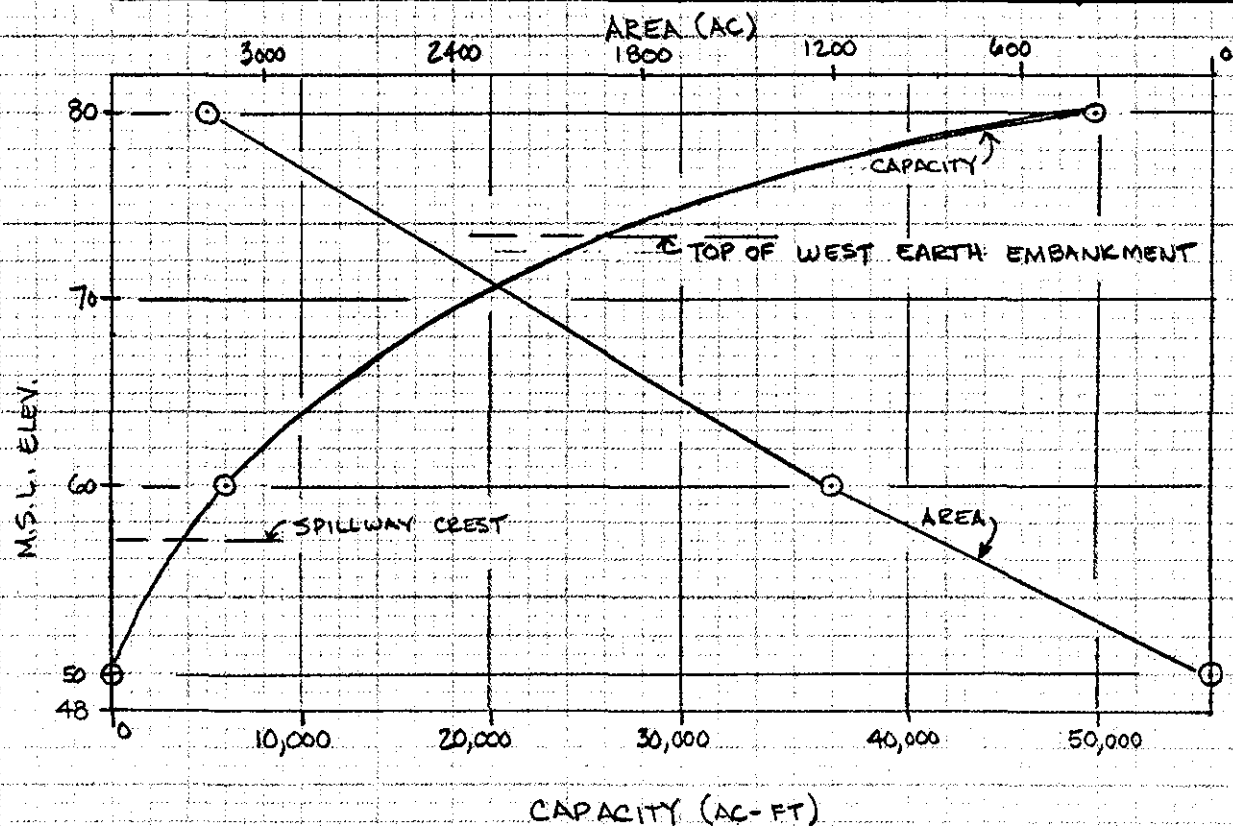
20799-13

DATE

2/6/79

CHERRYFIELD DAM WAS NOT DESIGNED TO PROVIDE STORAGE CAPACITY. IT IS A SINGLE-PURPOSE PROJECT, BEING DESIGNED TO PREVENT FLOODING DOWNSTREAM DUE TO ICE JAMS. THE FOLLOWING AREA DATA WAS PLANIMETERED FROM USGS QUADS.

M.S.L. ELEV.	AREA (AC)	AVG. AREA (AC)	DEPTH INTERVAL (FT)	Δ VOL (AC-FT)	VOL (AC-FT)
50.0	0				0
60.0	1,200	600	10	6,000	6,000
80.0	3,180	2,190	20	43,800	49,800
100.0	5,260	4,220	20	84,400	134,200



ABOVE AREA-CAPACITY DATA AGREES WITH U.S. CORPS OF ENGINEERS DATA (MAX. DIFF. = 15%), DIFFERENCE AT ELEV 60 & ELEV 80, LESS THAN 1%.

D-8

Cherryfield Dam



PROJECT
CHERRYFIELD DAM
TEST FLOOD ANALYSIS

COMP BY
JJD
CHK. BY
BTB

JOB NO.
20744-13
DATE
2/6/79

TEST FLOOD ANALYSIS

DRAINAGE AREA - 232 SQUARE MILES

SIZE CLASSIFICATION - INTERMEDIATE (MAX. STORAGE = 26,000 AF)

HAZARD CLASSIFICATION - HIGH HAZARD POTENTIAL

DESCRIPTION - FLAT

TEST FLOOD - 1/2 PMF

PMF PEAK FLOW RATE = 300 CFS/SQ. MI.

PMF PEAK DISCHARGE = $232 \times 300 \text{ CFS} \times \text{MI}^2$ = 69,600 CFS

1/2 PMF PEAK DISCHARGE = 34,800 CFS

ELEVATION - DISCHARGE - STORAGE DATA :

M.S.L. ELEV. (FT)	DISCHARGE CAP. OF DAM (CFS.) ^{1/}	SURCHARGE STORAGE (AC-FT) ^{2/}
57.0	0	0
58.0	400	700
60.0	1,800	2,300
62.0	4,100	4,100
64.0	6,700	6,400
66.0	9,600	8,700
68.0	13,000	11,700
70.0	16,800	15,200
72.0	20,800	19,300
TOPOF DAM @ 73.5 FT - 74.0	25,200	23,900
76.0	31,700	29,500
78.0	40,500	38,300
80.0	51,000	46,100
82.0	62,700	54,500
84.0	75,500	62,900

^{1/} STOP LOGS IN PLACE AT SLUICWAYS

^{2/} CAPACITY AT SPILLWAY CREST = 3,700 AC-FT



PROJECT
CHERRYFIELD DAM
TEST FLOOD ANALYSIS

COMP. BY
JJD
CHK. BY
JTB

JOB NO.
20799-13
DATE
3-6-79

$$\frac{1}{2} \text{ PMF PEAK INFLOW} = 34,800 \text{ CFS}$$

$$(1) \text{ SURCHARGE HEIGHT TO PASS } \frac{1}{2} \text{ PMF} = 19.7 \text{ FT (76.7 FT M.S.L.)}$$

$$\text{STOR}_1 = \frac{32,600 \text{ AC-FT}}{232} \times \frac{12}{640} = 2.63 \text{ INCHES OF RUNOFF}$$

$$Q_{p2} = 34,800 \left(1 - \frac{2.63}{9.5} \right) = 25,150 \text{ (CFS)}$$

$$(2) \text{ SURCHARGE HEIGHT TO PASS } Q_{p2} = 17.0 \text{ FT (74.0 FT M.S.L.)}$$

$$\text{STOR}_2 = 23,900 \text{ (AC-FT)} = 1.93 \text{ INCHES}$$

$$\text{STOR}_{\text{AVE}} = (\text{STOR}_1 + \text{STOR}_2) / 2 = 2.28 \text{ IN}$$

$$Q_{p3} = 34,800 \left(1 - \frac{2.28}{9.5} \right) = 26,450 \text{ CFS}$$

$$(3) \text{ SURCHARGE HEIGHT TO PASS } Q_{p3} = 17.4 \text{ FT (74.4 FT M.S.L.)}$$

$$\text{STOR}_3 = 24,960 \text{ AC-FT} = 2.02 \text{ INCHES}$$

$$(\text{STOR}_{\text{AVE}} + \text{STOR}_3) / 2 = 2.15$$

$$Q_{p4} = 34,800 \left(1 - \frac{2.15}{9.5} \right) = 26,920 \text{ CFS}$$

$$(4) \text{ SURCHARGE HEIGHT TO PASS } Q_{p4} = 17.5 \text{ FT (74.5 FT M.S.L.)}$$

ROUTED $\frac{1}{2}$ PMF DATA :

- (1) PEAK DISCHARGE = 27,000 CFS
- (2) ELEVATION = 74.5 FT M.S.L.
- (3) OVERTOPS WEST EMBANKMENT BY 1.0 FT.
- (4) SPILLWAY CAPACITY IS 89% OF $\frac{1}{2}$ PMF OUTFLOW



PROJECT
CHERRYFIELD DAM
EFFECT OF
TEST FLOOD ANALYSIS - SURCHARGE STORAGE

COMP. BY JJD	JOB NO. 20799-13
CHK. BY BTB	DATE 3-6-79

$$\text{PMF PEAK INFLOW} = 69,600 \text{ CFS}$$

$$(1) \text{ SURCHARGE HEIGHT TO PASS PMF} = 26.1 \text{ FT (83.1 FT M.S.L.)}$$

$$\text{VOLUME OF SURCHARGE (STOR}_1\text{)} = 59,000 \text{ AC-FT}$$

$$\text{STOR}_1 = 4.77 \text{ INCHES OF RUNOFF}$$

$$\begin{aligned} Q_{p2} &= Q_{p1} \left(1 - \frac{\text{STOR}_1}{19} \right) = 69,600 \left(1 - \frac{4.77}{19} \right) \\ &= 52,133 \text{ CFS} \end{aligned}$$

$$(2) \text{ SURCHARGE HEIGHT TO PASS } Q_{p2} = 23.2 \text{ FT (80.2 FT M.S.L.)}$$

$$\text{VOLUME OF SURCHARGE (STOR}_2\text{)} = 46,900 \text{ AC-FT}$$

$$\text{STOR}_2 = 3.79 \text{ INCHES OF RUNOFF}$$

$$(\text{STOR}_1 + \text{STOR}_2) / 2 = 4.28 \text{ IN} = \text{STOR}_{\text{AVE}}$$

$$Q_{p3} = 69,600 \left(1 - \frac{4.28}{19} \right) = 53,922 \text{ CFS}$$

$$(3) \text{ SURCHARGE HEIGHT TO PASS } Q_{p3} = 23.5 \text{ FT (80.5 FT M.S.L.)}$$

$$\text{VOLUME OF SURCHARGE (STOR}_3\text{)} = 48,178 \text{ AC-FT}$$

$$\text{STOR}_3 = 3.90 \text{ IN}$$

$$(\text{STOR}_3 + \text{STOR}_{\text{AVE}}) / 2 = 4.09 \text{ INCHES}$$

$$Q_{p4} = 69,600 \left(1 - \frac{4.09}{19} \right) = 54,618$$

$$(4) \text{ SURCHARGE HEIGHT TO PASS } Q_{p4} = 23.6 \text{ FT (80.6 FT M.S.L.)}$$

ROUTED PMF DATA :

- (1) PEAK DISCHARGE = 55,000 CFS
- (2) ELEVATION = 80.6 FT M.S.L.
- (3) OVERTOPS WEST EMBANKMENT BY 7.1 FEET
- (4) " CRIB ABUTMENTS " 5.6 FEET (EAST CRIB)
- (5) SPILLWAY CAPACITY IS 44% OF PMF OUTFLOW

D-11

Cherryfield Dam



DAM FAILURE ANALYSIS

IN CONVEYANCE WITH ENGINEERS INVOLVED IN THE INSPECTION

FAILURE OF THE DAM WOULD MOST LIKELY OCCUR AT AN EARTH EMBANKMENT SECTION. FOR FAILURE ANALYSIS, FAILURE WAS ASSUMED TO OCCUR AT THE EAST EMBANKMENT SECTION AT THE ABUTMENT CRIB. A BOTTOM WIDTH OF 40 FEET AND A TOP WIDTH OF 60 FT. WAS ESTIMATED FOR THE FAILURE SECTION.

(1) STORAGE AT TIME OF FAILURE = 26,000 AC-FT

(2) DISCHARGE JUST PRIOR TO FAILURE = 24,000 CFS

(3) FAILURE OUTFLOW, Q_p

$$Q_p = \frac{8}{27} W_b \sqrt{G} Y_o^{3/2}, \quad W_b = 50 \text{ FT (AVG WIDTH)}$$

$$Y_o = 73.5 - 50,$$

$$= 9,600 \text{ CFS}$$

(4) PEAK OUTFLOW AT FAILURE = 33,600 CFS = Q_p

(5) TIME FOR RESERVOIR TO EMPTY, T

$$T = \frac{12.1 S}{\frac{1}{2} Q_p} = \frac{12.1 (26,000)}{\frac{1}{2} (33,600)} = 18.7 \text{ HOURS}$$

NOTE : A DISCHARGE OF 24,000 CFS IS A SIGNIFICANT FLOOD, AND IS NOT TREATED AS A STEADY STATE FLOW.

CHERRYFIELD DAM
DAM FAILURE ANALYSIS

JJD

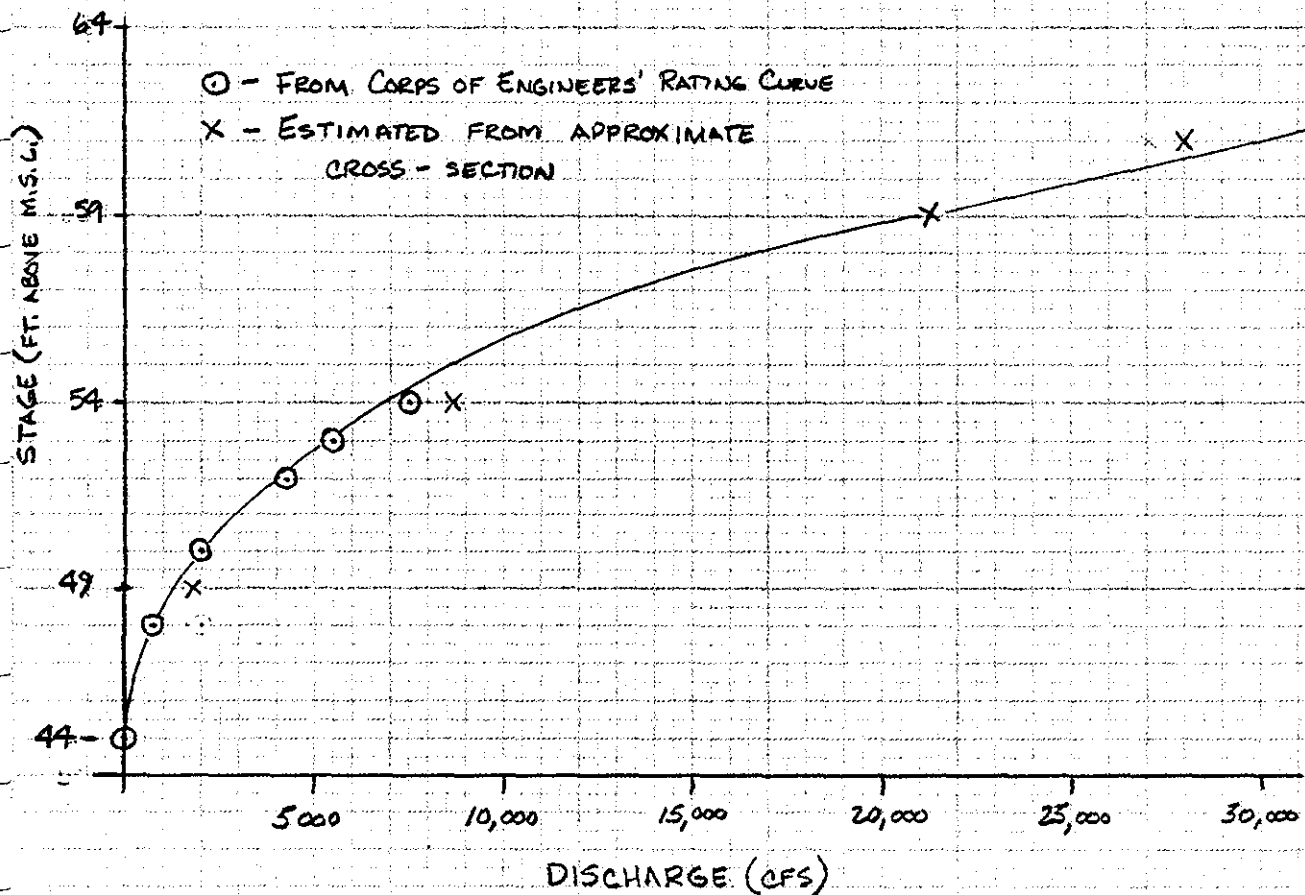
20799-13

BTB

2-7-79

CROSS-SECTION #1
(AT U.S.G.S. GAGE LOCATED 0.2 MILES
BELOW DAM)

THE FOLLOWING RATING CURVE WAS OBTAINED FROM THE
CORPS OF ENGINEERS' "OPERATION AND MAINTENANCE MANUAL"
FOR THE CHERRYFIELD DAM.

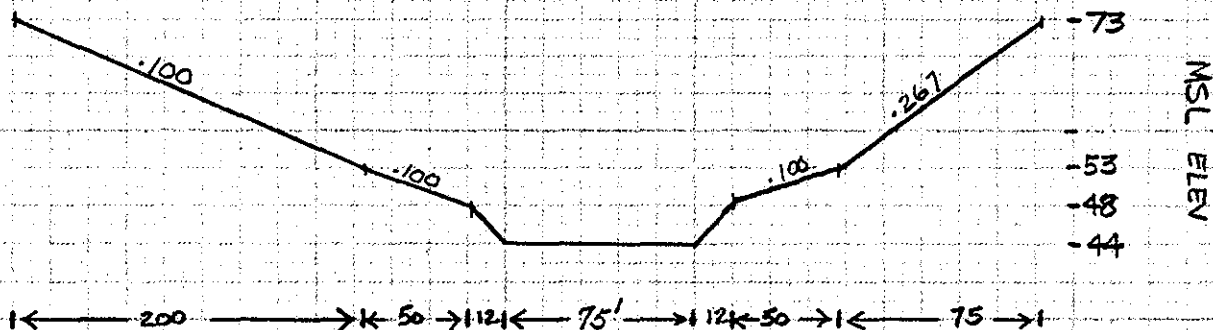


PROJECT
CHERRYFIELD DAM
DAM FAILURE ANALYSIS

COMP. BY
JJD
CHK. BY
BTB

JOB NO.
20799-13
DATE
3-7-79

APPROXIMATE CROSS-SECTION AT
USGS GAGE
(LOOKING DOWNSTREAM)



$$\text{SLOPE} = 10/2000 = .005$$

$$n_{\text{stream}} = .045 \quad n_{\text{overbank}} = .075$$

W.S. ELEV	1.486 n		AREA		P		R		S	Q		
	ST.	OB.	ST.	OB.	ST.	OB.	ST.	OB.		ST.	OB.	TOT.
53	33.0	19.8	843	250	100	100	8.43	2.50	.005	8,032	640	8,673
48	"	"	348	0	100	0	3.48	0	"	1,850	0	1,850
58	33.0	19.8	1338	922	100	169	13.4	5.46	.005	17,312	3957	21,269
60	"	"	1536	1287	100	197	15.4	6.53	"	21,785	6217	28,000

THIS RATING TABLE IS WITHIN $\pm 10\%$ OF USGS RATING CURVE GIVEN IN
"DETAILED PROJECT REPORT" FOR THE RANGE OF VALUES GIVEN IN THE REPORT.
THERE IS NO REDUCTION IN PEAK DUE TO VALLEY STORAGE BETWEEN
THE GAGE AND THE DAM. T.

STAGE JUST PRIOR TO FAILURE = 14.6 FT CORRESPONDING TO A
WATER SURFACE ELEVATION OF 65.6 FT M.S.L.

STAGE AT PEAK OUTFLOW AT FAILURE = 17.0 FT CORRESPONDING TO A
WATER SURFACE ELEVATION OF 68.0 FT M.S.L.



CHERRYFIELD DAM

JJD

20199-13

DAM FAILURE ANALYSIS

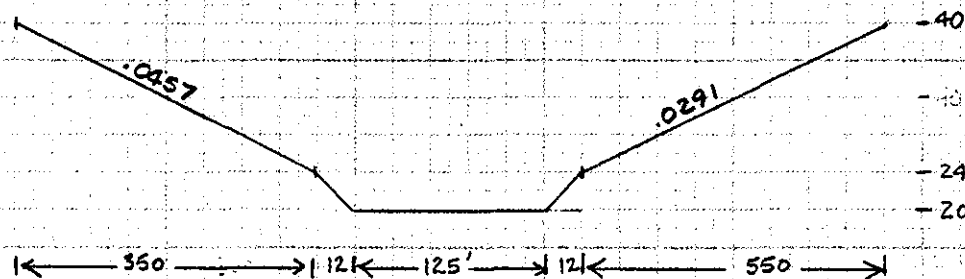
CHK. BY

DATE

BTB

3-7-79

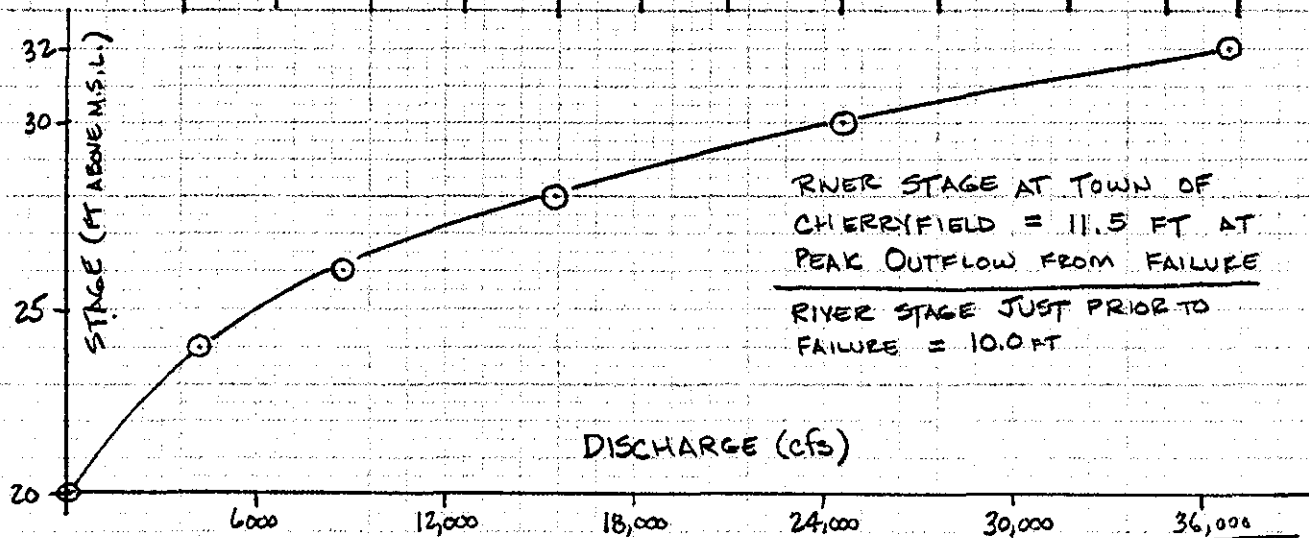
CROSS-SECTION #2
(APPROXIMATELY 1 MILE BELOW DAM)
(LOOKING DOWNSTREAM)
(AT TOWN OF CHERRYFIELD)
VALLEY STORAGE INSIGNIFICANT



$$\text{SLOPE} = 20/2100 = .0095$$

$$n_{st} = .045, n_{ob} = .075$$

W.S. ELEV.	1.486 n		AREA		P		R		SLOPE	Q		
	ST	OB	ST	OB	ST	OB	ST	OB		ST	OB	TOT
24	33.0	19.8	548	0	150	0	3.65	0	.0095	4,145	0	4,145
26	"	"	846	11.2	150	112	5.64	1.00	"	8,523	216	8,739
28	"	"	1,144	450	150	225	7.63	2.00	"	14,065	1372	15,437
30	"	"	1,442	1012	150	337	9.61	3.00	"	20,650	4032	24,682
32	"	"	1,740	1,800	150	450	11.6	4.00	"	28,214	8672	36,886



D-15

Cherryfield Dam

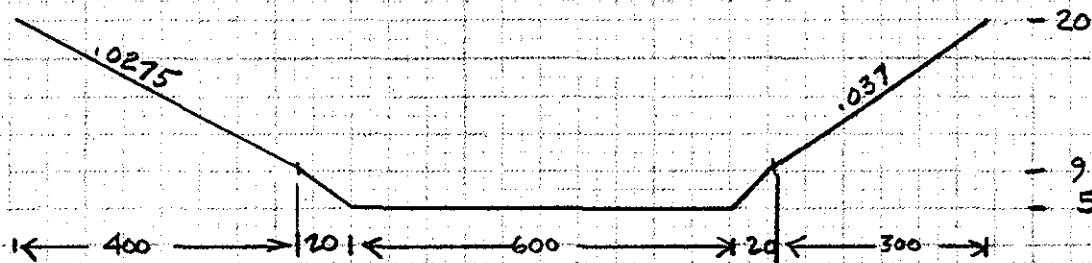


PROJECT
CHERRYFIELD DAM
DAM FAILURE ANALYSIS

COMP. BY
JJD
CHK. BY
BTB

JOB NO.
20799-13
DATE
3-7-79

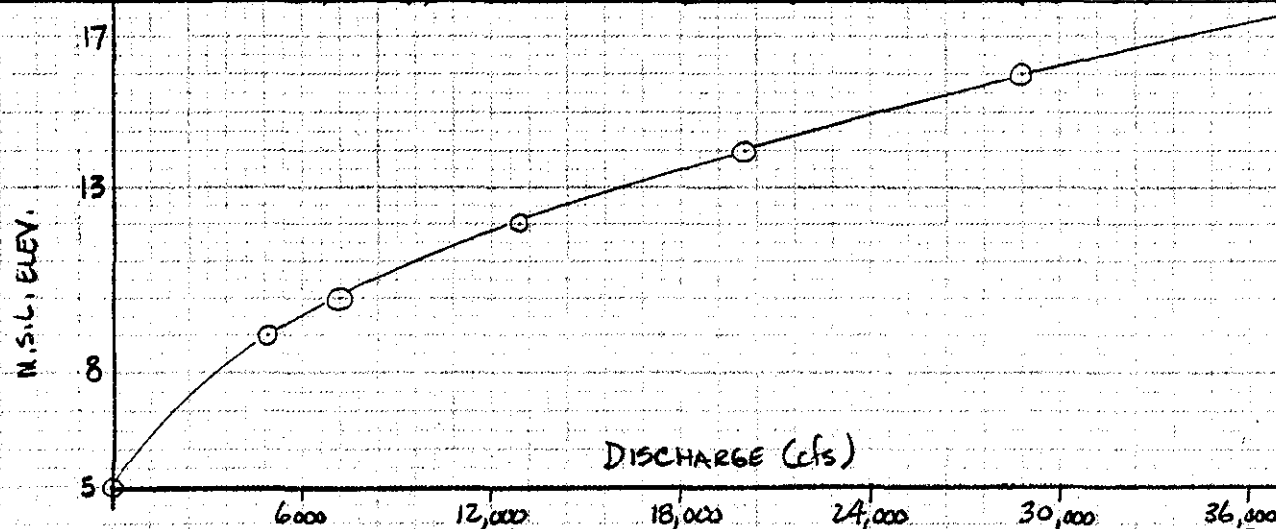
CROSS-SECTION #3
(LOCATED APPROX. 5.7 MILES BELOW DAM
JUST ABOVE TOWN OF MILBRIDGE)



SLOPE = .0006

$n_{st} = .045$, $n_{ob} = .075$

W.S.	1:486		AREA		P		R		SLOPE	Q		
ELEV.	ST	OB	ST	OB	ST	OB	ST	OB		ST	OB	TOT
9	33.0	19.8	2,480	0	641	0	3.87	0	.0006	4,896	0	4896
10	"	"	3,120	32	641	64	4.87	0.5	"	7,167	10	7177
12	"	"	4,400	285	641	190	6.86	1.5	"	12,683	181	12,864
14	"	"	5,680	792	641	317	8.86	2.5	"	19,377	703	20,080
16	"	"	6,960	1,553	641	444	10.9	3.5	"	27,152	1,721	28,873
18	"	"	8,240	2,567	641		12.9	4.5	"	35,933	3,360	39,292



D-16

Cherryfield Dam



PROJECT
CHERRYFIELD DAM
DAM FAILURE ANALYSIS

COMP. BY JJD	JOB NO. 20799-13
CHK. BY BTB	DATE 3-7-79

$$Q_{p1} = 33,600 \text{ CFS} \quad \text{TRIAL STAGE} = 12 \text{ FT (ELEV 17 FT M.S.L.)}$$

$$V_1 \approx \left(\frac{25,000 \times 9,600}{43,560} \right) = 5,510 \text{ AC-FT}$$

$$Q_{p2} (\text{TRIAL}) = 33,600 \left(1 - \frac{5,510}{26,000} \right) = 26,480 \text{ CFS}$$

$$V_2 \approx \frac{7,790 \times 25,000}{43,560} = 4,470 \text{ AC-FT}$$

$$V_{AVE} = 4990 \text{ AC-FT}$$

$$Q_{p2} = 33,600 \left(1 - \frac{4990}{26,000} \right) = 27,200 \text{ CFS}$$

RIVER STAGE = 10.6 FT (ELEV 15.6 FT M.S.L.) - JUST AFTER FAILURE

PRIOR TO FAILURE, RIVER STAGE = 9 FT USING A ROUTED Q = 20,300 CFS

HAZARD POTENTIAL :

(1) AT CHERRYFIELD, ME. - APPROX 50 BUILDINGS
FLOOD DEPTHS OF 1 TO 7 FEET

(2) AT MILLBRIDGE, ME. - APPROX 10 BUILDINGS
FLOOD DEPTHS OF 1 TO 5 FEET

NOTE : A SIGNIFICANT FLOOD EVENT WOULD BE OCCURRING IF SPILLWAY
WERE DISCHARGING AT CAPACITY (JUST SLIGHTLY LESS THAN THE 1/2 PMF
WOULD BE OCCURRING). A SIGNIFICANT HAZARD WOULD ALREADY EXIST



APPENDIX E

Information as Contained in the National
Inventory of Dams



INVENTORY OF DAMS IN THE UNITED STATES

STATE	IDENTITY NUMBER	DIVISION	STATE	COUNTY	CONGR DIST.	STATE	COUNTY	CONGR DIST.	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY MO YR
ME	61	NED	ME	029	02				CHERRYFIELD DAM	436.6	6756.3	01JUN78

POPULAR NAME	NAME OF IMPOUNDMENT
	NARRAGAUGUS RIVER

REGION	BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	DIST FROM DAM (MI.)	POPULATION
01	01	NARRAGAUGUS RIVER	CHERRYFIELD	1	950

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCTURAL HEIGHT (FT.)	HYDRAULIC HEIGHT (FT.)	IMPOUNDING CAPACITIES	
					MAXIMUM (ACRE-FT.)	NORMAL (ACRE-FT.)
REEROT	1961	C	25	24	26000	3700

DIST OWN FED R PRV/FED SCB A VER/DATE
NED N N N N 01JUN78

REMARKS
21-TIMBER CRIB

(N)	(N)	(N)	(D)	(D)	(N)	(D)	(N)	(D)	(N)	(D)	(N)	(D)	(N)	(D)	(N)	(D)	(N)	(D)
O/S HAS	SPILLWAY			MAXIMUM DISCHARGE (FT.)	VOLUME OF DAM (CY)	POWER CAPACITY		NAVIGATION LOCKS										
	CREST LENGTH	TYPE	WIDTH (FT.)			INSTALLED (MW)	PROPOSED (MW)	NO.	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)
1	500	U	135	24000														

OWNER	ENGINEERING BY	CONSTRUCTION BY
TOWN OF CHERRYFIELD	CORPS OF ENGINEERS	BANDERS CONST CORP

REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
CORPS OF ENG	CORPS OF ENG	CORPS OF ENG	CORPS OF ENG

INSPECTION BY	INSPECTION DATE DAY MO YR	AUTHORITY FOR INSPECTION
EDWARD C JORDAN CO	29NOV78	PUBLIC LAW 92-367 8AUG1972

REMARKS